Whitebark Pine in the Pacific Northwest: What's Next?

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Abstract

Conservation and restoration of whitebark pine are two important challenges facing us in the immediate future. We will present our approach for a whitebark pine conservation strategy which will focus on Federal lands in Oregon, Washington and California. This management plan will identify the actions needed to reduce the threats to the continued existence of whitebark pine throughout the planning area. Following the completion of the strategy, we will develop a land manager's guide for restoration and managing whitebark pine. This manual will describe site assessments, provide a decision-making guide for setting stand level prioritization, and explain restoration techniques. In our presentation we will review these restoration techniques and discuss the challenges of their application to the highly variable whitebark pine stands in the Pacific Northwest.

Introduction

Conservation and restoration of whitebark pine are two important challenges facing us in the immediate future. Today, our previous speakers have provided us with an overview of whitebark pine ecology, distribution of the species in the Pacific Northwest, and an introduction to its status with respect to white pine blister rust. While we realize that in most of our areas, mortality and infection rates are less severe than in the Rocky Mountains, we still feel that it is time for us to take action to protect and restore these communities.

Whitebark pine is distributed in high-elevation areas just above and below forest line. While this habitat is a very small component of the Pacific Northwest landscape, most of these areas are under federal ownership. In Washington, about 5% of our landscape is above forest line; 66% of these areas are managed by the US Forest Service and 27% by the National Park Service **(**Rochefort et al. 2006). Although Oregon has much less area in the subalpine and alpine zone, the trend is still the same – 88% is managed by the US Forest Service and 6% by the National Park Service. Based on our joint ownership of these areas, we feel that we (i.e. our agencies) have a primary responsibility to encourage and facilitate research on whitebark pine and to develop strategies for long-term protection of the species. This afternoon, we would like to provide you with a brief overview of some of the inter-agency activities that we have been involved in. We would also like to share with you some of the challenges that we see before us with respect to whitebark pine restoration.

Development of Conservation Strategies

Through the efforts of many individuals, we have conducted health assessments, updated the whitebark pine range map for Oregon and Washington, collected seed from stands across the

region, and conducted molecular genetic analysis and blister rust resistance testing. Our next step will be the development of a conservation strategy for whitebark pine in the Pacific Northwest and a restoration guide for land managers.

Our conservation goal is to provide a high likelihood that whitebark pine and associated species will exist, well-distributed, throughout the Pacific Northwest. There are a number of large scale issues to be considered. Given the critical role that whitebark pine seed plays in the grizzly bear diet, we will put special emphasis on the North Cascades Grizzly Bear Recovery Area (Grizzly Bear Outreach Project 2005). Other regional scale issues include patterns of genetic variation which will be used in determining seed transfer guidelines, delineation of local populations, important for connectivity among populations, and patterns of blister rust resistance across the landscape. The two key objectives of the conservation strategy are to 1) define conservation units, and 2) prioritize these units for conservation and restoration. We were inspired by the approach used by The Nature Conservatory to create a blueprint for conservation (The Nature Conservancy of Canada. No date.). In this approach, a portfolio of sites is selected for the area under consideration that provides an effective and efficient network at the least cost. There are 6 steps to build a site-based conservation strategy:

1. Define the planning area
2. Prepare a comprehensive base map
3. Collect relevant ecological information.
4. Develop criteria to apply to each planning unit.
5. Select a portfolio of sites based on these using a computer model.
6. Critically analyze the results.

The criteria (step 4) will include grizzly bear habitat, wilderness designation, level of blister rust infection, the level or trend of mountain pine beetle infestation, acres burned versus historic, and access (miles from the nearest road or trailhead) among others.

The Natural Conservatory developed a computer model for site-portfolio selection (The Nature Conservancy 1999). An excellent example of the application of this model, called the SITES model, is the plan for conservation of threatened and endangered species along the Santa Clara River (Court et al. 2000). Since the symposium, we have become aware of a model that is even better suited to our goals. The Ecosystem Management Decision Support (EMDS) system, developed by the U.S.D.A. Forest Service is "an application framework for knowledge-based decision support of ecological assessments at any geographic scale" (Redlands Institute. No date.). This approach will allow us to prioritize the sites for conservation and restoration and display the network of sites in GIS. Site prioritization is essential for the allocation of the limited funds available. The conservation strategy will be completed by June 2008.

Once the portfolio of sites has been selected, managers will need information on restoration options and techniques. The *Land Manager's Guide for Restoring and Managing Whitebark Pine* will provide tools for the conservation and, where appropriate, restoration of whitebark pine. It will be formatted after a landowner's guide for Oregon white oak (Pacific Wildlife

Research 2004) and will include direction on site assessments, restoration planning and technique selection. The guide will be completed by September 2008.

Development of Restoration Strategies

Management Philosophies

One of the first steps in developing a restoration strategy or plan is to identify broad goals or management philosophies for the area. Setting broad goals for a site regarding plant communities, spatial scales, and ecological processes actions is essential to a successful project. Broad goals establish a foundation upon which to create more detailed objectives. Two basic questions that should be addressed at this stage are:

1.) What are your management objectives?
2.) What spatial scale are you addressing in your restoration strategy?

In a very broad sense, management objectives are developed following one of two management philosophies: Are you preserving whitebark pine? Or Are you mitigating for anthropogenic influences? While these two philosophies sound similar, they are really defining different desired future conditions of the site. If your goal is to preserve whitebark pine, then you are defining your management goal in terms of a plant community or state. If however, you are removing anthropogenic influences, then you are focusing your management actions on restoring ecosystem processes. National Park Service Management Policies (National Park Service 2006) address these goals by stating:"…The Service will not attempt to solely preserve individual species (except threatened or endangered species) or individual process; rather it will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems. Just as all components of a natural system will be recognized as important, natural change will also be recognized as an integral part of the functioning of natural systems." (National Park Service 2006, chapter 4.1).

In the case of whitebark pine and blister rust, these two management objectives are often compatible and in fact subsets of one another. In the Pacific West, the primary threat to whitebark pine survival often is blister rust so, by mitigating the anthropogenic influence (i.e. blister rust introduction) we are actually preserving whitebark pine. However, this is not always the case. To illustrate how your restoration prescription could be very different depending which on management objective you select, I would like you to imagine a whitebark pine site. The site is located in the subalpine parkland and is dominated by subalpine fir (*Abies lasiocarpa*) and whitebark pine (*Pinus albicaulis*). Mature trees are growing in scattered clumps and regeneration is a mixture of whitebark pine and subalpine fir; subalpine fir is the dominant species in both the overstory and regeneration. The open stand is very close to a closed canopy forest and both stands contain dead and infected whitebark pine trees. Approximately 20% of mature whitebark pine trees are infected with blister rust and about 25% appear to have died from it. Many mature whitebark pines still appear in good condition and to be producing cones. The site is a seral whitebark pine site (e.g. rather than a climax whitebark pine site) so, next you try to discern the disturbance regime that resulted in the two stand ages. You cannot find any signs of fire, but you notice

an avalanche chute and believe that the younger stand developed following an avalanche that probably occurred at least 200 years ago. So what is your restoration prescription?

If you are preserving whitebark pine, you will look at the site and ask, is whitebark pine survival threatened on this site? Subalpine fir is dominating both the overstory regeneration. In many areas, the openings between tree clumps are closing and suitable habitat for whitebark pine seedling establishment is decreasing. In addition, blister rust is present and you are not certain if the density of regeneration present is sufficient to sustain the population. In this case, you may decide that you want to maintain the open natural of the mixed-species stand and not allow it to succeed to a subalpine fir, closed-canopy dominated forest. In order to preserve whitebark pine, you decide to: remove small pockets of subalpine fir to create openings for whitebark pine regeneration, propagate and plant whitebark pine seedlings in the openings, and continue to monitor whitebark pine for blister rust infection and mortality. In the future, you may create more openings and hope to identify rust-resistant trees from which to propagate more seedlings.

If you are preserving natural processes and mitigating for anthropogenic influences, you may prescribe a different management strategy for the site. The site is a seral community that will naturally succeed to a closed-canopy subalpine fir forest. The site was originally cleared following an avalanche and you do not believe that current management has decreased the frequency of avalanches. When you ask the question, what are the human influences to the ecosystem, the answer is blister rust. Although the density of whitebark pine seedlings is decreasing you must decide if this is a result of blister rust or due to a reduction in suitable habitat caused by canopy closures. If density is decreasing because of canopy closure, then you may choose to continue to monitor the site and accept that it will succeed to a subalpine fir stand, with little whitebark pine. However, if you determine that seedling density is decreasing because blister rust has caused a reduction in cone production or high mortality of seedlings, then you may decide to plant whitebark pine seedlings, but not create new openings. In this scenario, you are trying to insure that whitebark pine is still in the stand so that when a natural disturbance occurs, the species still has the resilience to respond to the disturbance as it would have without blister rust.

As you can see by these two examples, the decision to protect state or process is not an easy one. While the previous examples highlighted philosophical differences, practical considerations such as funding, adjacent resources, or recreational opportunities must also be considered at each site. Sometimes, your restoration strategy for a site may be the same even with different management goals.

Spatial Scales

In addition to identifying your management philosophies, a restoration plan should also define the spatial scale that you are working on. There are three spatial scales that we feel we work on: landscape or regional, mid-level, and stand level. Landscape scale strategies focus on geographic areas such as the range of whitebark pine or whitebark pine in the Cascade Range. Although the boundaries of these areas may vary with different plans, they are based on ecological attributes rather than ownership or management responsibilities. The Conservation Strategy that Carol is working on is an example of a plan aimed at the

landscape scale. Mid-level spatial scales are management defined rather than based on ecological characteristics. Mid-level scales may reflect a particular agencies "sphere of influence" such as all National Parks in the Pacific West Region or all US Forests in Region 6. Stand level spatial scales are based on both ecological and management considerations. A stand is the scale at which many restoration projects are focused due to our ability to manage a specific area. If we decide to plant whitebark pine seedlings or manually remove competing vegetation to create openings for regeneration, we are probably working on the stand level. If we are restoring fire to an ecosystem, we could be working on any one of these three levels.

Depending on the spatial scale you are addressing, the detail of the information you must address may change. For instance, if you are working on a landscape scale, you may state that you would like to protect naturally evolving levels of genetic diversity in whitebark pine populations. However, when you develop plans for stand level restoration, you may need to address the mechanics of this strategy. If you have a stand that is still producing cones, but no regeneration is survival due to lack of suitable habitat or predation you may decide to propagate seedlings from seeds collected on site. In this case, you determine the number of cones collected and number of trees from which to collect the cones to protect genetic diversity and based on you prediction of survival rates. However, if your site has limited regeneration because there is no cone production, how far from this site to you travel to collect cones? When do you decide that genetically resistant stock is your preferred seed source and how does this influence genetic diversity? This is just one example of how the spatial scale will influence the details in your restoration plan or strategy. Identification of spatial scale is an important factor in the development of restoration strategies and plans because it sets the geographic boundaries by which we will plan and evaluate our actions in the future.

Stand Level Restoration Methods

Initially, you conduct a stand analysis in which basic characteristics of the stand are recorded: species composition, whether it is a seral or climax stand, stand structure, stand health (e.g. blister rust, beetles, other diseases), and disturbance regime (what is the primary disturbance, frequency, and has it been altered). At some point, you should identify your management objectives and philosophies. Theoretically, you should know your management philosophies before you conduct the stand exam (e.g. such as NPS Management Policies), but practically, these often evolve as you conduct the stand exam and identify restoration alternatives. In the site review, you should document what the impediments are to whitebark pine survival – lack of cone production, lack of suitable habitat for regeneration, seedling mortality, cone predation, beetles, blister rust, interrupted fire regime, tree competition. Then you must review what management zone your site is in and how do management policies influence your selection of management goals or restoration methods. Is the site in designated Wilderness or a front country, developed zone? Is the site within endangered species habitat, a historic landscape, or the urban interface? Are there other policies that restrict your selection of restoration strategies? Last, you can select your restoration tools. Some of these tools include removal of competing trees (manually or with fire), cone collection, seeding, planting of seedlings, removal of branches with cankers, and introduction

of fire. All restoration plans should include monitoring and reporting to insure that adaptive management will be informed by scientific data.

Conclusion

This morning, and over the next few days we expect to hear more facts and figures regarding infection and mortality rates. Although we could be discouraged by these numbers, we are also optimistic. We are optimistic because so many people have been able to conduct surveys to provide us with accurate estimates of blister rust infection and mortality rates. We are optimistic because the Pacific West whitebark pine stands are as diverse as our rugged topography. The diversity that our whitebark pine stands encompass includes species composition, successional stage, disturbance regime, and white pine blister rust infection and mortality rates. We are encouraged because there are so many tools for us to use to conserve whitebark pine. We feel that based on the diversity of our stands and individual stand histories, that restoration strategies that are mildly successful in some areas may be very successful in other areas and this will allow us to adapt and develop successful management techniques for all areas. However, we do not want this feeling of optimism to allow us to relax – there is urgency to our mission. Global climate change may facilitate a faster progression of blister rust infection at high elevations than in the past. Beetles life cycles may shorten and allow beetle-caused mortality to increase. Fire regimes are expected to change and we cannot predict how this will influence the blister rust cycles in our areas. This conference has helped to strengthen our whitebark pine networks within the west and we hope that we can continue to share information and develop successful whitebark pine protection strategies.

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